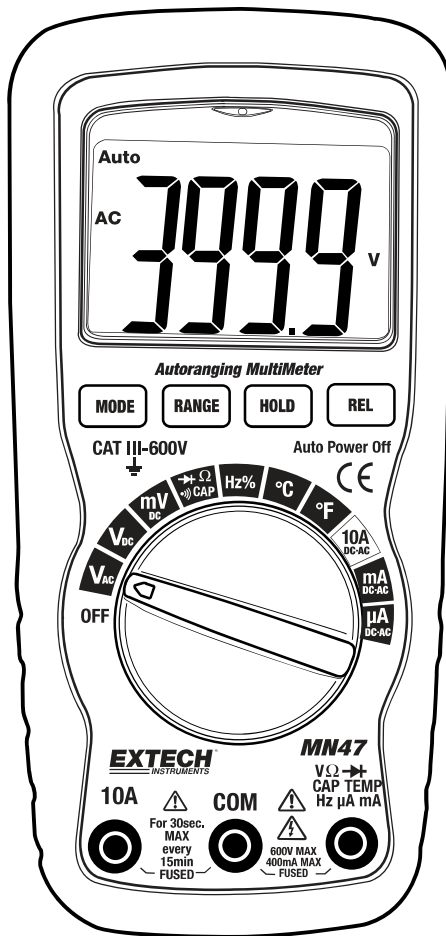


User's Guide

EXTECH[®]
INSTRUMENTS
A FLIR COMPANY

Autoranging Multimeter

Model MN47



Introduction

Congratulations on your purchase of the MN47 MultiMeter. The MN47 offers AC/DC Voltage, AC/DC Current, Resistance, Diode, and Continuity and Temperature. Proper use and care of this meter will provide many years of reliable service.

Safety



This symbol adjacent to another symbol, terminal or operating device indicates that the operator must refer to an explanation in the Operating Instructions to avoid personal injury or damage to the meter.

WARNING

This WARNING symbol indicates a potentially hazardous situation, which if not avoided, could result in death or serious injury.

CAUTION

This CAUTION symbol indicates a potentially hazardous situation, which if not avoided, may result damage to the product.



This symbol advises the user that the terminal(s) so marked must not be connected to a circuit point at which the voltage with respect to earth ground exceeds 600V.

This symbol adjacent to one or more terminals identifies them as being associated with ranges that may, in normal use, be subjected to particularly hazardous voltages. For maximum safety, the meter and its test leads should not be handled when these terminals are energized.

SAFETY INSTRUCTIONS

This meter has been designed for safe use, but must be operated with caution. The rules listed below must be carefully followed for safe operation.

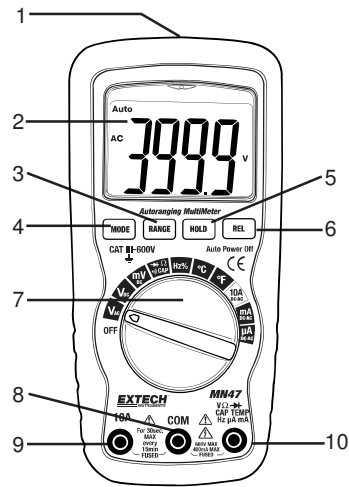
1. NEVER apply voltage or current to the meter that exceeds the specified maximum:

Input Protection Limits	
Function	Maximum Input
V DC or V AC	600V AC and DC
mA AC/DC	400mA DC/AC
A AC/DC	10A DC/AC (for 30 seconds max. every 15 minutes)
Frequency, Resistance, Capacitance, Duty Cycle, Diode, Continuity, Temperature	250V DC/AC




2. USE EXTREME CAUTION when working with high voltages.
3. DO NOT measure voltage if the voltage on the "COM" input jack exceeds 600V above earth ground.
4. NEVER connect the meter leads across a voltage source while the function switch is in the current, resistance, or diode mode. Doing so can damage the meter.
5. ALWAYS discharge filter capacitors in power supplies and disconnect the power when making resistance or diode tests.
6. ALWAYS turn off power and disconnect test leads before opening the covers to replace the fuse or battery.
7. NEVER operate the meter unless the back cover and the battery and fuse covers are in place and fastened securely.
8. DO NOT use the meter if the meter or test leads look damaged, or if you suspect the meter is not operating properly.
9. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Controls and Jacks

1. Non-Contact AC voltage tester
2. 4000 count LCD display
3. RANGE button
4. MODE button
5. HOLD button
6. RELATIVE button
7. Function switch
8. COM (negative) input jack
9. Positive 10A input jack
10. Positive input jack



Symbols and Annunciators

-  Continuity
-  Diode test
-  Low battery
- HOLD Data hold
- Auto Autoranging
- AC Alternating current
- DC Direct current
- REL Relative
- μ micro (amps)
- m milli (volts, amps)
- k kilo (ohms)
- Ω Ohms

OPERATING INSTRUCTIONS

WARNING: Risk of electrocution. High-voltage circuits, both AC and DC, are very dangerous and should be measured with great care.

1. ALWAYS turn the function switch to the OFF position when the meter is not in use.
2. If OL appears in the display, the value exceeds the range you have selected. Change to a higher range.

NOTE: On some low AC and DC voltage ranges, with the test leads not connected to a device, the display may show a random, changing reading. This is normal and is caused by the high-input sensitivity. The reading will stabilize and give a proper measurement when connected to a circuit.

RANGE BUTTON

When the meter is first turned on, it automatically goes into autoranging mode. To manually select the range to be tested perform the following.

1. Press RANGE button. The AUTO display will turn off.
2. Press RANGE button to step through the available ranges.
3. Press and hold the RANGE button for 2 seconds to exit the manual ranging mode and return to autoranging.

NOTE: Manual ranging does not apply for Capacitance, Frequency, Diode, Continuity and Duty Cycle.

DATA HOLD BUTTON

Data hold allows the meter to “freeze” a measurement in the display.

1. Press DATA HOLD button to “freeze” the reading on the LCD. The indicator “HOLD” will appear on the display.
2. Press DATA HOLD button to return to normal operation

RELATIVE BUTTON

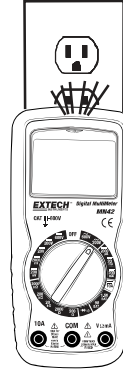
The relative measurement feature allows you to make measurements relative to a stored reference value. A reference voltage, current, etc. can be stored and measurements made in comparison to that value. The displayed value is the difference between the reference value and the measured value.

1. Perform any measurement as described in operating instructions.
2. Press the RELATIVE button to store the reading in the display and the REL indicator will appear on the display.
3. The display will now indicate the difference between the stored value and measured value.
4. Press the RELATIVE button to return to normal operation.

NON-CONTACT AC VOLTAGE DETECTOR

WARNING: Always test the NCV function on a known live circuit before use

1. Turn the rotary switch to any measurement position
2. Hold the top of the meter very close to the voltage source as shown.
3. If voltage is present, the LED above the display will glow. **NOTE:** The detector is designed with high sensitivity. Static electricity or other sources of energy may randomly trip the sensor. This is normal operation.

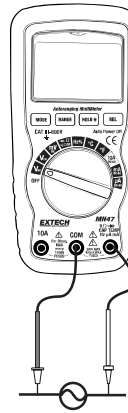


AC VOLTAGE MEASUREMENTS

WARNING: Risk of Electrocution. The probe tips may not be long enough to contact the live parts inside some 240V outlets for appliances because the contacts are recessed deep in the outlets. As a result, the reading may show 0 volts when the outlet actually has voltage on it. Make sure the probe tips are touching the metal contacts inside the outlet before assuming that no voltage is present.

CAUTION: Do not measure AC voltages if a motor on the circuit is being switched ON or OFF. Large voltage surges may occur that can damage the meter.

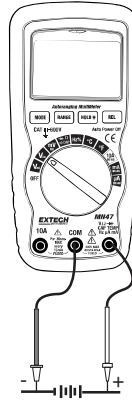
1. Set the function switch to the VAC position.
2. Insert the black test lead banana plug into the negative COM jack. Insert the red test lead banana plug into the positive V jack.
3. Touch the black test probe tip to the neutral side of the circuit.
4. Touch the red test probe tip to the "hot" side of circuit.
5. Read the voltage in the display.



DC VOLTAGE MEASUREMENTS

CAUTION: Do not measure DC voltages if a motor on the circuit is being switched ON or OFF. Large voltage surges may occur that can damage the meter.

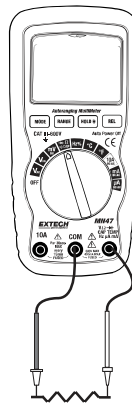
1. Set the function switch to the VDC position.
2. Insert the black test lead banana plug into the negative COM jack. Insert the red test lead banana plug into the positive V jack.
3. Touch the black test probe tip to the negative side of the circuit. Touch the red test probe tip to the positive side of the circuit.
4. Read the voltage in the display.



RESISTANCE MEASUREMENTS

WARNING: To avoid electric shock, disconnect power to the unit under test and discharge all capacitors before taking any resistance measurements. Remove the batteries and unplug the line cords.

1. Set the function switch to the Ω position.
2. Insert the black test lead banana plug into the negative COM jack. Insert the red test lead banana plug into the positive Ω jack.
3. Touch the test probe tips across the circuit or component under test. It is best to disconnect one side of the circuit under test so the rest of the circuit will not interfere with the resistance reading.
4. Read the resistance in the display.

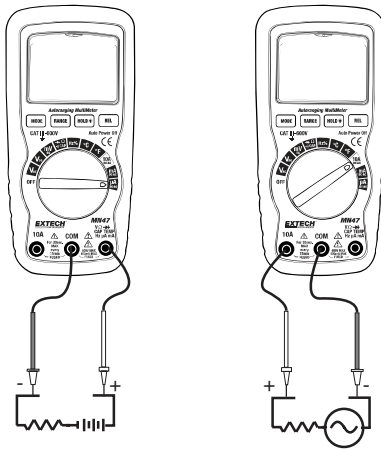


AC / DC CURRENT MEASUREMENTS

CAUTION: Do not make current measurements at 10 Amps for longer than 30 seconds. Exceeding 30 seconds may cause damage to the meter and/or the test leads.



WARNING: To avoid electric shock, do not measure AC current on any circuit whose voltage exceeds 250VAC.

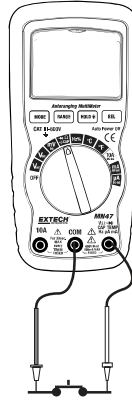
1. Insert the black test lead banana plug into the negative COM jack.
2. For current measurements up to $4000\mu\text{A}$, set the function switch to the μA position and insert the red test lead banana plug into the mA/ μA jack
3. For current measurements up to 400mA, set the function switch to the mA position and insert the red test lead banana plug into the mA/ μA jack.
4. For current measurements up to 10A, set the function switch to the 10A range and insert the red test lead banana plug into the 10A jack.
5. Use the MODE button to select AC or DC current.
6. Remove power from the circuit under test, then open up the circuit at the point where you wish to measure current.
7. Touch the black test probe tip to the negative side of the circuit. Touch the red test probe tip to the positive side of the circuit.
8. Apply power to the circuit.
9. Read the current in the display.






CONTINUITY CHECK

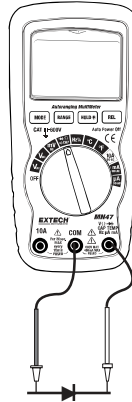
WARNING: To avoid electric shock, never measure continuity on circuits or wires that have voltage on them.

1. Set the function switch to the Ω  position.
2. Press the MODE button to select continuity .
3. Insert the black lead banana plug into the negative COM jack.
4. Insert the red test lead banana plug into the positive jack.
5. Touch the test probe tips to the circuit or wire under test.
6. If the resistance is $< 30\Omega$, a tone will sound.



DIODE TEST

1. Set the function switch to the Ω  position.
2. Insert the black test lead banana plug into the negative COM jack and the red test lead banana plug into the positive  jack.
3. Use the MODE button to view the  icon on the display.
4. Touch the test probes to the diode under test. If one reading shows a value and the other reading shows "OL" the diode is good. Reverse voltage will indicate "OL". Shorted devices will indicate near 0V and an open device will indicate "OL" in both polarities.
5. The value indicated in the display is the forward voltage.

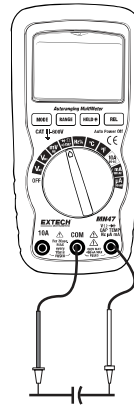


CAPACITANCE MEASUREMENTS

WARNING: To avoid electric shock, discharge the capacitor before measuring.

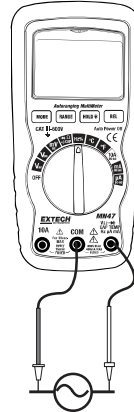
1. Rotate the function switch to the CAP position.
2. Press the MODE button to select capacitance (nF and a small value will appear in the display).
3. Insert the black test lead banana plug into the negative COM jack. Insert the red test lead banana plug into the positive CAP jack.
4. Touch the black test probe tip to one side of the device. Touch the red test probe tip to the other side of the device.
5. Read the capacitance value in the display.

Note: For very large values of capacitance measurement time can be several seconds before the final reading stabilizes.



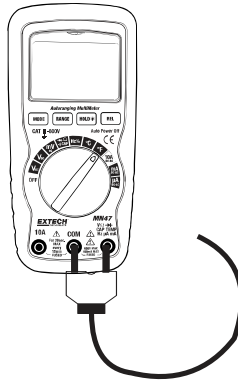
FREQUENCY MEASUREMENTS

1. Rotate the function switch to the Hz% position.
2. Insert the black test lead banana plug into the negative COM jack. Insert the red test lead banana plug into the positive HZ jack.
3. Touch the black test probe tip to one side of the device. Touch the red test probe tip to the other side of the device.
4. Read the Frequency value display.



TYPE K TEMPERATURE MEASUREMENT

1. Rotate the function switch to the °F or °C temperature position.
2. Insert the Temperature Probe into the negative COM jack and the TEMP jack.
3. Place the temperature probe tip where needed.
4. Read the temperature on the display.



MAINTENANCE

WARNING: To avoid electric shock, disconnect the test leads from any source of voltage before removing the back cover or the battery or fuse covers.

WARNING: To avoid electric shock, do not operate your meter until the battery and fuse covers are in place and fastened securely.


This MultiMeter is designed to provide years of dependable service, if the following care instructions are performed:

1. **KEEP THE METER DRY.** If it gets wet, dry it immediately.
2. **USE AND STORE THE METER IN NORMAL TEMPERATURES.** Temperature extremes can shorten the life of the electronic parts and distort or melt plastic parts.
3. **HANDLE THE METER GENTLY AND CAREFULLY.** Dropping it can damage the electronic parts or the case.
4. **KEEP THE METER CLEAN.** Wipe the case occasionally with a damp cloth. **DO NOT** use chemicals, cleaning solvents, or detergents.
5. **USE ONLY FRESH BATTERIES OF THE RECOMMENDED SIZE AND TYPE.** Remove old or weak batteries so they do not leak and damage the unit.
6. **IF THE METER IS TO BE STORED FOR A LONG PERIOD OF TIME,** the battery should be removed to prevent damage to the unit.

BATTERY INSTALLATION and LOW BATTERY INDICATION

WARNING: To avoid electric shock, disconnect the test leads from any source of voltage before removing the battery cover.

LOW BATTERY INDICATION

The  icon will appear in the display when the battery voltage becomes low. Replace the batteries when this appears.

BATTERY REPLACEMENT

1. Disconnect the test leads from the meter.
2. Remove the Phillips head screws (2) which secure the rear battery compartment cover.
3. Remove the fuse/battery compartment cover to access the battery.
4. Replace the 9V battery, observing polarity.
5. Replace and secure the fuse/battery compartment cover .



You, as the end user, are legally bound (Battery ordinance) to return all used batteries and accumulators; disposal in the household garbage is prohibited!

You can hand over your used batteries / accumulators at collection points in your community or wherever batteries / accumulators are sold!

Disposal: Follow the valid legal stipulations in respect of the disposal of the device at the end of its lifecycle

REPLACING THE FUSES

1. Disconnect the test leads from the meter.
2. Remove the Phillips head screws (2) which secure the rear battery compartment cover.
3. Remove the fuse/battery compartment cover to access the fuses.
4. Gently remove the fuse(s) and install new fuse(s) into the holder(s).
5. Always use fuses of the proper size and value (0.5A/250V fast blow for the 400mA range, 10A/250V fast blow for the 10A range).
6. Replace and secure the fuse/battery compartment cover .

RANGE SPECIFICATIONS

Function	Range	Resolution	Accuracy
DC Voltage (V DC)	400mV	0.1mV	$\pm(0.5\% \text{ reading} + 2 \text{ digits})$
	4V	1mV	$\pm(1.2\% \text{ reading} + 2 \text{ digits})$
	40V	10mV	
	400V	100mV	
	600V	1V	$\pm(1.5\% \text{ reading} + 2 \text{ digits})$
AC Voltage (V AC) (50/60Hz)	400mV	0.1mV	$\pm(1.5\% \text{ reading} + 15 \text{ digits})$
	4V	1mV	$\pm(1.2\% \text{ reading} + 3 \text{ digits})$
	40V	10mV	$\pm(1.5\% \text{ reading} + 3 \text{ digits})$
	400V	100mV	
	600V	1V	$\pm(2.0\% \text{ reading} + 4 \text{ digits})$
DC Current (A DC)	400 μ A	0.1 μ A	$\pm(1.0\% \text{ reading} + 3 \text{ digits})$
	4000 μ A	1 μ A	$\pm(1.5\% \text{ reading} + 3 \text{ digits})$
	40mA	10 μ A	
	400mA	100 μ A	
	10A	10A	$\pm(2.5\% \text{ reading} + 5 \text{ digits})$
AC Current (A AC) (50/60Hz)	400 μ A	0.1 μ A	$\pm(1.5\% \text{ reading} + 5 \text{ digits})$
	4000 μ A	1 μ A	$\pm(1.8\% \text{ reading} + 5 \text{ digits})$
	40mA	10 μ A	
	400mA	100 μ A	
	10A	10A	$\pm(3.0\% \text{ reading} + 7 \text{ digits})$
Resistance	400 Ω	0.1 Ω	$\pm(1.2\% \text{ reading} + 4 \text{ digits})$
	4k Ω	1 Ω	$\pm(1.0\% \text{ reading} + 2 \text{ digits})$
	40k Ω	10 Ω	$\pm(1.2\% \text{ reading} + 2 \text{ digits})$
	400k Ω	100 Ω	
	4M Ω	1k Ω	
	40M Ω	10k Ω	$\pm(2.0\% \text{ reading} + 3 \text{ digits})$
Capacitance	4.000nF	1pF	$\pm(5.0\% \text{ reading} + 50 \text{ digits})$
	40.00nF	10pF	$\pm(5.0\% \text{ reading} + 7 \text{ digits})$
	400.0nF	0.1nF	$\pm(3.0\% \text{ reading} + 5 \text{ digits})$
	4.000 μ F	1nF	
	40.00 μ F	10nF	
	100.0 μ F	0.1 μ F	$\pm(5.0\% \text{ reading} + 5 \text{ digits})$

Notes:

Accuracy specifications consist of two elements:

- (%reading) – This is the accuracy of the measurement circuit.
- (+ digits) – This is the accuracy of the analog to digital converter.

Accuracy is stated at 65°F to 83°F (18°C to 28°C) and less than 70% RH.

Function	Range	Resolution	Accuracy
Frequency	9.999Hz	0.001Hz	±(1.5% reading + 5 digits)
	99.99Hz	0.01Hz	
	999.9Hz	0.1Hz	±(1.2% reading + 3 digits)
	9.999kHz	1Hz	
	99.99kHz	10Hz	
	999.9kHz	100Hz	
		9.999MHz	1kHz
Duty Cycle	0.1%-99.99%	0.1%	±(1.2% reading + 2 digits)
Temperature	-20°C~+760°C	1°C	±(3.0% reading + 5°C/9°F)
	-4°F~+1400°F	1°F	
Diode Test	0.3mA typical	1mV	±(10% reading + 5 digits)

GENERAL SPECIFICATIONS

Display	4000 count LCD with function indication
Over-range indication	"OL" is displayed
Auto Power Off	After 15 minutes (approximately) of inactivity
Polarity	Automatic (no indication for positive); Minus (-) sign for negative
Input Impedance	>1M Ω
ACV Bandwidth	45Hz to 450Hz
DCA voltage drop	200mV
NCV voltage range	100VAC to 600VAC
Audible continuity:	Audible threshold: less than 30 Ω Test current: <0.3mA
Measurement Rate	2 times per second, nominal
Low Battery Indication	"BAT" is displayed when battery voltage drops below operating level.
Battery	One (1) 9V (NEDA 1604) IEC 6F22 battery
Fuses	mA, μ A ranges; 0.5mA/250V fast blow A range; 10A/250V fast blow
Operating Temperature	32°F to 122°F (0°C to 50°C)
Storage Temperature	-4°F to 140°F (-20°C to 60°C)
Operating Humidity	<70% RH
Storage Humidity	<80% RH
Operating Altitude	7000ft. (2000meters) maximum.
Weight	8.99 oz (255g)
Size	5.9" x 2.8" x 1.9" (150 x 70 x 48mm)
Safety	This meter is intended for indoor use and protected, against the users, by class 2 double insulation per EN61010-1. CAT III 600V

PER IEC1010 OVERVOLTAGE INSTALLATION CATEGORY

OVERVOLTAGE CATEGORY I

Equipment of OVERVOLTAGE CATEGORY I is equipment for connection to circuits in which measures are taken to limit the transient overvoltages to an appropriate low level. Note – Examples include protected electronic circuits.

OVERVOLTAGE CATEGORY II

Equipment of OVERVOLTAGE CATEGORY II is energy-consuming equipment to be supplied from the fixed installation.

Note – Examples include household, office, and laboratory appliances.

OVERVOLTAGE CATEGORY III

Equipment of OVERVOLTAGE CATEGORY III is equipment in fixed installations.

Note – Examples include switches in the fixed installation and some equipment for industrial use with permanent connection to the fixed installation.

OVERVOLTAGE CATEGORY IV

Equipment of OVERVOLTAGE CATEGORY IV is for use at the origin of the installation.

Note – Examples include electricity meters and primary over-current protection equipment